"WIRING THE CITY FOR CABLE"

1. A FEW FACTS ABOUT CABLE
2. AN INSTITUTIONAL NETWORK
3. COST COMPARISONS

A WORKSHOP ON

CABLE TELEVISION

CAMBRIDGE, MASSACHUSETTS

NOVEMBER 6, 1982

Stern Telecommunications Corporation 50 West 40th Street, New York, N.Y. 10018 ■ (212) 719-4555

A FEW FACTS ABOUT CABLE TELEVISION

Cable Television opens up additional means of communication. In addition to providing better reception for network programs, CATV provides opportunities for local programming and narrowcasting, the production of programs for a specialized audience. CATV can bring in programming from neighboring areas, by interconnection, and can provide entertainment sent by satellite. Cable television also has two-way capability enabling the installation of home security services, medical alert services, traffic signal control, emergency alert storm warning, shop-at-home, or information retrieval from data bases. These services are available at additional costs and fees and can be provided to suit the community's needs and desires. They are written into the franchise agreement between the cable system and the municipality.

Cable television was developed during the late 1940's in communities unable to receive TV signals because of terrain or distance from TV stations. Cable systems located their antennas on a hilltop or at another location with good reception for picking up broadcast signals. These signals were distributed by coaxial cable to subscribers for a fee. Subscribers paid an installation fee to be connected, and several dollars per month for the service.

In 1950, seventy (70) communities in the U.S. had a cable television system, which served a total of 14,000 subscribers.

During the early 1950's, cable systems were offered to communities as a means of increasing the number of variety of programs available to the subscriber.

The cables running from the headend (the master antenna) to subscribers are strung on overhead utility poles along with electric or telephone wires, or are buried in underground ducts, sometimes along with other utility service lines. The signals are received at the headend and sent out to the home subscriber.

Cable systems operate under a franchise from the local municipality. From 1966 to 1980, the Federal Communications Commission (FCC) regulated the operation of cable systems in several ways. One significant regulation prohibited the importation of distant signals into the 100 largest television markets, thus effectively stopping cable from developing in the large cities. During this "freeze" in large market areas, cable systems continued to grow in small communities, where they offered additional services such as time, weather, news, and stock market information. Some began to carry local news or sports, and to originate local programming. These small community

systems were thriving because they offered their subscribers improved reception of television broadcasting, more channels, FM radio stations, and some local origination.

In 1972 (3/31/72) the FCC promulgated a new set of rules which affected the growth of cable. The rules allowed some distant signals to be brought in, and included:

- Local programming, usually known as "cablecasting," if the system has more than 3,500 subscribers.
- Leased channels of pay TV and other services.
- Public access to a cable channel.
- A channel for educational programming.
- A channel for municipal services.
- A capacity for two-way services, such as security and public opinion polling, that require return signals from the subscriber.
- A minimum twenty channel capacity.

The FCC rules were rescinded in 1980, but the industry has adopted these services as part of their competitive offerings to communities. The FCC continues to maintain some regulatory power. Rules regarding carriage of local broadcast signals, network program nonduplication protection, sports program blackouts, cross-ownership, equal employment opportunity, origination cablecasting, technical standards, cable television relay service, and recordkeeping and reporting, comprise the current cable television rules.

Today there are 4,400 operating cable systems in the United States, serving 10,200 communities including every state. Another 1,300 systems are approved but not built. Pennsylvania has the most systems (334) and California the most subscribers (2 million). Operating systems reach about 19 million subscribers, close to 25% of the nation's TV households. A projection has been made that cable will reach the rest of the country during the next 10-15 years.

A FEW FACTS

ABOUT

AN INSTITUTIONAL NETWORK

Introduction

The cable television coaxial cable, originally installed to provide improved reception for communities unable to receive TV signals because of terrain or distance from television stations, is now opening the way for improved communications on an institutional network.

The institutional network concept is very new. The concept grew out of the realization that a broadband communications system providing multi-channel program distribution to residential subscribers also has the capability to carry wideband data and special business communications signals to and from business and institutional locations. With the expansion of cable television service to urban centers, the potential of providing institutional services was recognized by communications planners, city officials, and cable system operators.

New Transmission Opportunities

As new computer systems developed and as more and more office automation evolved, a need for high speed communications to interconnect terminals with computers and to connect computers to computers was recognized. The telephone companies and the specialized common carriers began to offer special data services to business and government agencies. When cable television systems began to appear in urban areas, they introduced broadband, high speed data capability as an intrinsic part of the design.

Institutional Network

The institutional network is a totally separate section of the cable system. In some cases, the institutional network may be created on the same cable and distribution system which goes to subscribers' homes. In most locations however, the institutional network is designed as an isolated and separate cable system which frequently parallels, in geographical location, the cable providing subscriber services. With the aid of a computer at the headend, it is now possible to interconnect the institutional network with the subscriber network, thus creating a two-way fully interactive system for a community.

The greatest advantage of a broadband institutional network for large institutions is the potential of high speed data transmission, video retrieval from record storage, teleconferencing, and an interconnection with nationwide and worldwide satellite communications services. To use such services on telephone lines or other common carriers at the present time is very costly. Broadband coaxial cable presents an alternative system for these institutions, with the potential for a cost-effective service.

Institutional Networks in Operation

There are no operational institutional networks in effect today other than on an experimental basis. There were about 16 customers being serviced by Manhattan Cable Television in lower Manhattan who could be considered part of an institutional network and that experiment was recently expanded. Limited data transfer service between two factory locations exists in Dayton, Ohio. In San Francisco, California, an experiment is underway with SBS. Portland, Oregon's new institutional network is about to begin operation, and their experience will assist other pioneering systems presently in design or under construction.

Applications

Institutional networks are being offered by cable companies or requested by franchising authorities, to provide for lower cost, higher speed interchange of information between institutions. These institutions can be not-for-profit municipal departments such as the police and fire, federal, state and regional agencies, hospitals, libraries, colleges and universities, and other public service organizations. They may also be for-profit institutions such as banks, insurance companies, manufacturers and retail outlets.

Data transmission as the foremost application of the coaxial cable, is gaining increased attention from institutions seeking to accelerate and improve their management information systems. Other applications are also being discussed as urban centers are being franchised and wired. Some of these include energy management, security and surveillance services, telemedical links among health delivery agencies and teleconferencing.

The coaxial cable, originally installed to deliver entertainment and educational programs to home subscribers has opened the way for improved communications and efficient operation for institutions in the public and private sector.

COST COMPARISON OF SYSTEM DESIGN OPTIONS

	Option 1 Single cable subscriber system plus 10-mile institutional trunk	Option 2 Dual cable subscriber system plus 10-mile institutional trunk	Option 3 Dual cable subscriber system plus full area institutional trunk
Capital Cost for reception, origination & distribution facilities	$ 4,885,000	$ 8,939,000	$ 9,753,000
Cost per residential unit passed, exclusive of converters and drops	118	216	236
Capital Cost including converters* & drops**			
Converter Class 1)	$ 9,717,100	$13,771,100	$14,585,100
Converter Class 2)	8,643,300	12,697,300	13,511,300
Converter Class 3)	7,972,175	12,026,175	12,840,175
Capital Cost per subscriber***			
Converter Class 1)	$ 362	$ 513	$ 543
Converter Class 2)	322	473	503
Converter Class 3)	297	448	478

* Converter Class

1) One-Way addressable converter: $120
2) Programmable converter: 80
3) Non-addressable converter: 55

** Drops at $60 each.

*** Penetration assumed as 65% of 41,300 residential units, or 26,845 subscribers)

COMPARISON OF SYSTEM COST PARAMETERS

	Cambridge						
	Option #1	Option #2	Option #3	Boston	Brockton	Quincy	Springfield
System design	Single cable subs. network, 10 mile single cable insti. network	Dual cable subs. network, 10 mile single cable inst. network	Dual cable subs. network, fully parallel single inst. network	Dual cable subs. network, fully parallel dual cable inst. network	Dual cable subs.network, 20 mile dual cable inst. network	Dual cable subscriber network, with inst. capacity	Dual cable subs. network, 40 mile single cable inst. network
Total system cost (MM)	$ 9.7	$13.8	$14.6	$ 93.0	$ 8.6	$ 5.8	$20.0
Total housing units	41,300	41,300	41,300	225,000	34,600	33,500	48,800
Subscribers (65% penetration)	26,845	26,845	26,845	146,250	22,490	21,490	31,720
Cost per subscriber	$ 362	$ 513	$ 543	$ 635	$ 382	$266	$630

EXPLANATION OF OPTIONS:

Option #1: A single cable system providing a minimum of 50 downstream and 4 upstream channels for subscriber services, plus a ten-mile, dedicated, institutional trunk with 20 upstream and 20 downstream channels.

Option #2: A two cable system providing between 50 and 100 downstream and 8 upstream channels for subscriber services. The second cable would also include channels allocated for institutional users, as would the ten-mile dedicated institutional trunk with 20 upstream and 20 downstream channels.

Option #3: A three cable system with over 100 downstream and 8 upstream channels dedicated to subscriber services, and a separate institutional network with 20 upstream and 20 downstream channels running throughout the City.

NOTES

Stern
Telecommunications
Corporation

50 West 40th Street, New York, N.Y. 10018
(212) 719-4555

Joseph L. Stern
President

City Manager's Cable TV Advisory Committee

Response to a request by the Office of Cable Television on the state of cable technology from John Ward (M.I.T.) and Joseph Stern (Stern Communications) International Telecommunications Consultants.

Questions:

Will Cable Technology become obsolete in the near future?

How will direct broadcast satellite affect cable?

What role will fiber optics play in future communications developments?

Response to a request by the City of Cambridge for information on the state of Cable technology from John Ward, international communications consultant and engineer.

Mass. Inst. of Technology
Room 35-402
Cambridge, MA 02139

December 6, 1982

Mr. Joseph G. Sakey
Office of Cable Television
449 Broadway
Cambridge, MA 02138

Dear Joe,

The three questions you ask have been raised in almost all of the dozen or so franchise operations that I have been involved with in the past 5 years, yet I see CATV operators falling all over themselves to invest the billions of dollars it is taking to wire up the major U.S. cities with coaxial cable. I am sure that they would not be doing this if they and their financial backers thought that coaxial cable would become obsolete in the near future, that direct broadcast satellites (DBS) would shortly cut into their subscriber base, or that cost competitive fiber optic components for CATV distribution were just around the corner. These people are spending their own money in an endeavor with a fairly long payback period and obviously feel that the present cable technology is the right one to go with. I have no reason to doubt their judgement.

In regard to DBS, I feel that the major market will be in non-urban areas that are not densely populated enough for profitable cable operations. Of course, they will attract some subscribers in cabled urban areas if they have attractive programming and the price is right. Note, however, that because of spectrum limitations they cannot have anywhere near the channel diversity of cable, there is no possibility for interactive services unless the return transmissions are handled by telephone or cable facilities, and there will be no possiblity for local origination and access channels (the costs of using satellite transponders for local programming are prohibitive, even if uplink facilities were available). I thus feel that DBS will primarily offer premium channels that may have a hard time competing with similar channels on cable in the major urban areas. One thing that they may offer is high-definition (broad-bandwidth) TV requiring special TV receivers. But cable could do this too if it wanted to.

From all that I can gather, fiber is a long way off from being a replacement for coaxial cable in CATV distribution, both on cost and technical grounds. Fiber <u>is</u> beginning to be used in CATV systems for transport links, but I have seen no one talking seriously about using it in trunks, feeders, and drops. First of all, the present state of the technology is that bandwidth is limited by the emitters and detectors so that no more than about 12 channels can be carried per fiber. Second, there are at present no satisfactory equivalents of the splitters and taps so widely used in tree and branch cable, and even if there were, the consequent signal losses would defeat the main advantage of fibers -- the ability to go long distances without amplification. Amplification, when required, must be done with electrical amplifiers with conversion from and to optical signals each time. The serious talk of fibers in CATV systems is in a new architecture called switch-star which does not require splitters and taps and in which the home drops carry only 1-3 channels selected remotely

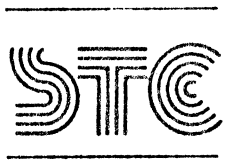
in a neighborhood switching center serving 50-100 homes. There is a Canadian trial of such a system in Alberta and another in Japan. The British government is having a big debate right now about whether to legislate such a configuration for the proposed new 30-channel CATV systems in England, and I recently spent two weeks as a technical consultant to the Department of Industry on the merits of such a move. I visited over a dozen companies planning to build and operate the new CATV systems or supply components, and reviewed a number of fiber system proposals, all of which were of the switched type. There was general agreement that such systems if built in the next few years would be 50-100% more expensive than a coaxial tree-and-branch system based on a variation of U.S. technology (British TV is UHF), and that although most feel that switched-fiber-star is the system of the future, they would expect government subsidy if forced to use it now by government edict. I would not hold my breath waiting for fibers to replace coaxial in the U.S.

I hope that these comments are of help. If you want to talk more about them, my office number is 253-3891 and my home phone 862-2750.

Sincerely,

John E. Ward

Stern Telecommunications Corporation
50 West 40th Street, New York, N.Y. 10018 ■ (212) 719-4555



Joseph L. Stern, *President*
Joseph Garodnick, *Vice President*

December 7, 1982

Mr. Joseph G. Sakey
Commissioner
CITY OF CAMBRIDGE
449 Broadway
Cambridge, Mass. 02138

Dear Joe:

Your letter of November 30 raised a number of questions which everyone has been considering relative to cable technology. I will try to respond to them based on our experience in the field.

Will cable technology become obsolete in the near future?

Cable technology will not become obsolete since the broadband coaxial cable is the most efficient method of distributing RF signals yet developed. A cable system constructed of coaxial cable can be upgraded with no change in the equipment to provide twice the number of channels (using new equipment being offered for delivery in 1985). It can be converted to an unlimited number of channels using off-premises converters and can be adapted for high-definition TV or narrow-band TV, one-way or two-way, without changing the cable. It is a system which will physically wear out before it becomes technically obsolete.

How will direct broadcast satellite installations affect cable?

Direct broadcast satellite services will be limited in the number of channels they can provide. DBS service will cost as much per home as cable service. DBS will offer 5 or 6 channels while cable service will offer 30, 40, 50 to 100. DBS will not impact cable in Cambridge.

What role will fiber optics play in future communications developments?

Fiber optics will play a very important role in areas where physical space is limited and where electrical interference is present. Fiber could be used to great advantage as the trunk in a congested conduit system. The disadvantage is that we do not yet know how to effectively tap a fiber system. Thus, the cost of a system with fiber is higher than a coaxial cable system. It is forecast by most technologists that within 5 years expansion of cable systems will be met by adding fiber supertrunks for interconnection and cross-connection and for specialized services.

Lastly, there is nothing to preclude mixing of fiber and coaxial cable where one has the advantage over the other.

I hope this has been helpful.

Best regards,

JOSEPH L. STERN

/eh

13 January, 1983

CITY MANAGER'S CABLE TV ADVISORY COMMITTEE

SUMMARY OF FINDINGS AND RECOMMENDATIONS

At the direction of the Cambridge City Council and the City Manager, leading consultants were commissioned to study the problems and costs of constructing a citywide cable television system, and to explore the financial viability of cable in Cambridge, particularly the economic and management implications associated with a municipally-owned cable system.

Cambridge hired Kalba-Bowen Associates, Inc. (a Cambridge-based research firm) and Stern Telecommunications Corporation (a New York headquartered communications engineering company) to conduct a cable construction feasibility study. The City subsequently contracted with Rice-Richter Associates of Washington, D.C. to prepare an economic analysis of cable development in Cambridge.

The Kalba-Bowen/Stern group proposed three cable systems design options and analyzed the construction problems and cost factors related to each.

Two of these options were deemed to be acceptable (options 1 and 3) option 2 was recommended.

Option #2 proposes a two-cable system providing up to 100 channels of subscriber service with light upstream channels. This option also provides a 10 mile loop dedicated to institutional and business services, but suggests that some of the citywide subscriber

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The Committee recommends the Independent Authority (which could well be a "Cambridge Municipal Light Plant) model of system ownership as the most appropriate for Cambridge.

The Committee concludes that the issuance of general obligation bonds, revenue bonds or a combination of these bonding methods would be the best means of financing the development of a municipal cable system in Cambridge.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

"By most industry criteria, Cambridge should be an excellent community for the development of a cable communications system. The City has an unusually high housing density per street mile...."

"The January 1982 market study of Cambridge residents indicated a high level of interest in receiving and purchasing cable television services and in local programming."

"(Either) of the cable system options (Option #2 and #3 from the Kalba-Bowen/Stern Telecommunications study) used in this analysis would meet or exceed industry standards for system design. However, Option #2 features a fiscally conservative approach while providing system capacity that should meet community needs in the foreseeable future."

"Either of the two system designs (is) viable using reasonable service rates and a 65 percent estimate of subscriber penetration. The less expensive plant design was economically viable at both the 50 and 65 percent subscriber penetration levels."

Estimates of the system worth at the end of the first 15 years of operation varied with each of six financial projections. System worth ranged from $25.7 million to $32.4 million.

"It is recommended that the City pursue the establishment of an Independent Authority to construct and operate the cable system and that planning funds be provided to formalize the structure, financing and cable communications system plans."

The Cable Television Advisory Committee believed that Rice-Richter's conservative assumptions and expert projections of future cable revenues support our recommendation that a publicly owned cable system would be financially successful.

City of Cambridge

In City Council January 17, 1983

The CITY COUNCIL *Committee* on CABLE TELEVISION conducted another in a series of public hearings for the purpose of discussing the report presented to the City Manager by the Cable Television Advisory Committee. The hearing was held on Thursday, January 13, 1983 beginning at 6:00 PM in the Council Chamber.

Councillor Clinton, Chairman of the Council Committee, opened the hearing by stating that he intended to discuss the economic liability of a publicly owned cable system as outlined in the Advisory Committee report.

At this time Mr. Joseph Sakey stated that in addition to addressing the liability question, the report also addressed the three major questions previously raised at other hearings. The questions are as follows:

1. Will Cable Technology become obsolite in the near future?

2. How will direct broadcast satelite affect cable?

3. What role will fiber optics play in future communications?

Mr. Sakey further stated that it was his beliefs that there is no more important issues which will face the City Council and impact the quality of life of the people of Cambridge than cable and whether or not it is municipality-owned. He further stated this could be a re-affirmation of the first amendment.

At this time Mr. William F. Zachmann, a member of the Advisory Committee stated that a cable network will provide an important two-way transmisison mechanism other than the telephone (a copy of his full statement is attached).

At this time Mr. Patrick D. Centanni, a member of the Advisory Committee stated he supports municipal ownership of a cable system since he believed it is economically feasible and will provide much additional revenue to the city. (A copy of his full statement is attached)

At this time Mrs. Jean Rice of Rice-Ritcher Associates gave a review on economic feasibility based on a presumed 50% and 65% penetration throughout the city. Essentially she stated that with a 50% role of penetration the capital expenditure from the city would be $14 million dollars with an operating expense of $10 million dollars with approximately 5,846 subscribers. Mrs. Rice then went on to compare these figures with a level of 65% penetration which would require a capital expenditure of $15.5 million dollars, and operating expenses of $26.8 million dollars, and a subscriber level of 7,443 people.

Councillor Wylie questioned the bonding mechanism for providing the money necessary to start a municipal system. Mr. Sakey responded by stating the committee recommends either general (city obligated) bonds or general revenue bonds or a combination of both. He further stated that the figure would be somewhere between $15 million and $18 million dollars.

Councillor David Sullivan questioned non-access cable such as a single disc and what effect that has on whats being considered here. Mr. Zachmann responded by stating he did not think that this kind of technology will advance for two decades.

Councillor Graham raised several questions regarding community jobs, a referendum for the next election relative to the expenditure of $15 - $18 million dollars and what if any thing it would do to the bond rating of the city. City Manager Healy stated he did not feel that such bonds would adversely effect the bond rating of the city but he would be very careful in the offering of the time they were put out to bid in order to make certain the projections in the numbers worked out. He further stated that realistically, the only problem he might be faced with is one of litigation by the private sector, if in fact the city adopts public ownership.

Councillor Graham further suggested the possibility of another feasibility study in the actual construction work before the Council goes forward to make certain that the city will not adopt the most costly method.

Councillor Graham further stated the city should move toward municipal ownership and that Mr. Sakey should provide a public education program on the exact cost of such so that the public can be well informed on the facts assuming there are referendum questions placed on the ballot.

At this time Mr. Paul Cianelli, Executive Director and General Counsel of the New England Cable Television Association stated that based on the two feasibility studies the city had commissioned, his organization was currently doing an analysis of same and would provide a report to the City Council by April. He further requested that the Council take no final action until that time. He further stated in response to several questions by Councillor Duehay that his organization has contracted with a Cambridge firm called Communication Strategies to explore the full range of issues presented in the Reis-Richter study as well as the City Manager's Advisory Committee report, including:

1. The financial assumptions used to test the viability of a municipally owned cable television system.

2. Existing municipally owned cable television systems and their record in serving the public.

3. The record of private ownership in the following areas:

   - the provision of access channels, equipment and training
   - local organization
   - job opportunities and training programs for local residents
   - meaningful local ownership opportunities
   - institutional networks and services
   - reasonable rate structures

4. The effect of competitive technologies on the risk associated with a cable television venture.

5. A further examination of case law precedents in the areas of first amendment and antitrust law.

Councillor Duehay stated he was alarmed that this kind of study and information comes to the Committee so late in the process and further stated that he believed this testimony was for future litigation efforts by the Cable industry since Mr. Cianelli had never before appeared before either the Advisory Committee or the Council Committee on Cable.

Mr. Cianelli responded by stating he is not here in an effort to litigate the final decision of the City Council, but he was asking the Council to hold such a decision in abeyance until the completion of his report. Relative to why he had not been here earlier, he stated that until October there was no reason to get involved because that's when the Rice-Ritcher report was completed.

At this time Councillor Duehay moved to accept the report of the City Manager's Advisory Committee and forward it to the full City Council for action.

For the Committee,

Daniel J Clinton

Councillor Daniel J. Clinton
Chairman

DJC/smc

Attachment (2)

#1

Placed on File

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17. S 34

REPORT

Committee on Cable Television

Re: report of the City Manager's Cable T.V. Advisory Committee.

In City Council,

January 17, 1983

1/17/83

Placed on file